

What is claimed is:

CLAIMS

1. A method for displaying genomic sequence data, the method including:

receiving an alphanumeric string representing genomic sequence data, said alphanumeric string comprising a plurality of characters, each of said characters representing a nucleotide in said genomic sequence; and

expressing said alphanumeric string using a representation which distinguishes a first plurality of nucleotides, sharing in common a first genomic attribute, from a second plurality of nucleotides, sharing in common a second genomic attribute, said second genomic attribute being different from said first genomic attribute.

2. A method according to claim 1 and wherein said first plurality of nucleotides are represented by at least one first representing attribute, and said second plurality of nucleotides are represented by at least one second representing attribute, said second representing attribute being different from said first representing attribute.

3. A method according to claim 1 and wherein said representation comprises a human sensible representation.

4. A method according to claim 2 and wherein said representation comprises a human sensible representation.

5. A method according to claim 4 and wherein said at least one first representing attribute and said at least one second representing attribute are graphical attributes.

6. A method according to claim 5 and wherein said graphical attributes are shapes.

7. A method according to claim 5 and wherein said graphical attributes are positions.

8. A method according to claim 7 and wherein said positions are vertical positions.

9. A method according to claim 5 and wherein said graphical attributes are orientations.

10. A method according to claim 9 and wherein said orientations are vertical orientations.

11. A method according to claim 5 and wherein said graphical attributes are colors.

12. A method according to claim 4 and wherein using said representation also includes representing each of the following four nucleotides:

adenine,

thymine,

cytosine, and

guanine,

by a different color.

13. A method according to claim 5 and wherein said human sensible representation comprises one of the following: a shape with a letter and a shape without a letter.

14. A method according to claim 5 and wherein said human sensible representation is produced using a computer font.

15. A method according to claim 14 and wherein said computer font is a TRUETYPE® font.

16. A method according to claim 1 and wherein said representation comprises a machine sensible representation.

17. A method according to claim 2 and wherein said representation comprises a machine sensible representation.

18. A method according to claim 17 and wherein said at least one first representing attribute and said at least one second representing attribute are machine sensible attributes.

19. A method according to claim 2 and wherein said first plurality of nucleotides are purine nucleotides, and said second plurality of nucleotides are pyrimidine nucleotides.

20. A method according to claim 2 and wherein said first plurality of nucleotides consists of adenine and thymine nucleotides, and said second plurality of nucleotides consists of guanine and cytosine nucleotides.

21. A method according to claim 2 and wherein said representation also distinguishes a third plurality of nucleotides, sharing in common a third genomic attribute, from a fourth plurality of nucleotides, sharing in common a fourth genomic attribute, said fourth genomic attribute being different from said third genomic attribute.

22. A method according to claim 21 and wherein said third plurality of nucleotides are represented by at least one third representing attribute, and said fourth plurality of nucleotides are represented by at least one fourth representing attribute, said at least one third representing attribute being different from said at least one fourth representing attribute.

23. A method according to claim 21 and wherein said first plurality of nucleotides are purine nucleotides, said second plurality of nucleotides are pyrimidine nucleotides, said third plurality of nucleotides are adenine and thymine nucleotides, and said fourth plurality of nucleotides are guanine and cytosine nucleotides.

24. A method of graphically displaying genomic sequence information, said method comprising:

receiving a first alphanumeric string representing a first genomic sequence and a second alphanumeric string representing a second genomic sequence, said second genomic sequence being a reversed-inversed genomic sequence of said first genomic sequence; and

graphically displaying said first alphanumeric string and said second alphanumeric string, such that a graphical display of said second alphanumeric string is a horizontal and vertical mirror image of a graphical display of said first alphanumeric string.

25. A method according to claim 24 and wherein said method also comprises expressing said first alphanumeric string and said second alphanumeric string using a representation which distinguishes a first plurality of nucleotides, sharing in common a first genomic attribute, from a second plurality of nucleotides, sharing in common a second genomic attribute, said second genomic attribute being different from said first genomic attribute.

26. A method according to claim 25 and wherein said first plurality of nucleotides are represented by at least one first representing attribute, and said second plurality of nucleotides are represented by at least one second representing attribute, said second representing attribute being different from said first representing attribute.

27. A method according to claim 25 and wherein said representation comprises a human sensible representation.

28. A method according to claim 26 and wherein said representation comprises a human sensible representation.

29. A method according to claim 28 and wherein said at least one first representing attribute and said at least one second representing attribute are graphical attributes.

30. A method according to claim 29 and wherein said graphical attributes are shapes.

31. A method according to claim 29 and wherein said graphical attributes are positions.

32. A method according to claim 31 and wherein said positions are vertical positions.

33. A method according to claim 29 and wherein said graphical attributes are orientations.

34. A method according to claim 33 and wherein said orientations are vertical orientations.

35. A method according to claim 29 and wherein said graphical attributes are colors.

36. A method according to claim 28 and wherein using said representation also includes representing each of the following four nucleotides:

adenine,

thymine,

cytosine, and

guanine,

by a different color.

37. A method according to claim 29 and wherein said human sensible representation comprises one of the following: a shape with a letter and a shape without a letter.

38. A method according to claim 29 and wherein said human sensible representation is produced using a computer font.

39. A method according to claim 38 and wherein said computer font is a TRUETYPE® font.

40. A method according to claim 26 and wherein said first plurality of nucleotides are purine nucleotides, and said second plurality of nucleotides are pyrimidine nucleotides.

41. A method according to claim 26 and wherein said first plurality of nucleotides consists of adenine and thymine nucleotides, and said second plurality of nucleotides consists of guanine and cytosine nucleotides.

42. A method according to claim 26 and wherein said representation also distinguishes a third plurality of nucleotides, sharing in common a third genomic attribute, from a fourth plurality of nucleotides, sharing in common a fourth genomic attribute, said fourth genomic attribute being different from said third genomic attribute.

43. A method according to claim 42 and wherein said third plurality of nucleotides are represented by at least one third representing attribute, and said fourth plurality of nucleotides are represented by at least one fourth representing attribute, said at least one third representing attribute being different from said at least one fourth representing attribute.

44. A method according to claim 42 and wherein said first plurality of nucleotides are purine nucleotides, said second plurality of nucleotides are pyrimidine nucleotides, said third plurality of nucleotides are adenine and thymine nucleotides, and said fourth plurality of nucleotides are guanine and cytosine nucleotides.

45. A genomic display system comprising:

a genomic sequence expressor operative to receive an alphanumeric string representing genomic sequence data, said alphanumeric string comprising a plurality of characters, each of said plurality of characters representing a nucleotide in said genomic sequence, and to express said alphanumeric string using a representation which distinguishes a first plurality of nucleotides, sharing in common a first genomic attribute, from a second plurality of nucleotides, sharing in common a second genomic attribute, said second genomic attribute being different from said first genomic attribute;

a display operative to receive an output from said expressor and to display said genomic sequence using said representation.

46. A genomic display system according to claim 45 and wherein said genomic sequence expressor is operative to express said alphanumeric string in a manner wherein said first plurality of nucleotides are represented by at least one first representing attribute, and said second plurality of nucleotides are represented by at least one second representing attribute, said second representing attribute being different from said first representing attribute.

47. A genomic display system according to claim 45 and wherein said representation comprises a human sensible representation.

48. A genomic display system according to claim 46 and wherein said representation comprises a human sensible representation.

49. A genomic display system according to claim 48 and wherein said at least one first representing attribute and said at least one second representing attribute are graphical attributes.

50. A genomic display system according to claim 49 and wherein said graphical attributes are shapes.

51. A genomic display system according to claim 49 and wherein said graphical attributes are positions.

52. A genomic display system according to claim 51 and wherein said positions are vertical positions.

53. A genomic display system according to claim 49 and wherein said graphical attributes are orientations.

54. A genomic display system according to claim 53 and wherein said orientations are vertical orientations.

55. A genomic display system according to claim 49 and wherein said graphical attributes are colors.

56. A genomic display system according to claim 48 and wherein using said representation includes representations of each of the following four nucleotides:

adenine,

thymine,

cytosine, and

guanine,

in a different color.

57. A genomic display system according to claim 49 and wherein said human sensible representation comprises one of the following: a shape with a letter and a shape without a letter.

58. A genomic display system according to claim 49 and wherein said human sensible representation employs a computer font.

59. A genomic display system according to claim 58 and wherein said computer font is a TRUETYPE® font.

60. A genomic display system according to claim 45 and wherein said representation comprises a machine sensible representation.

61. A genomic display system according to claim 46 and wherein said representation comprises a machine sensible representation.

62. A genomic display system according to claim 61 and wherein said at least one first representing attribute and said at least one second representing attribute are machine sensible attributes.

63. A genomic display system according to claim 46 and wherein said first plurality of nucleotides are purine nucleotides, and said second plurality of nucleotides are pyrimidine nucleotides.

64. A genomic display system according to claim 46 and wherein said first plurality of nucleotides consists of adenine and thymine nucleotides, and said second plurality of nucleotides consists of guanine and cytosine nucleotides.

65. A genomic display system according to claim 46 and wherein said genomic sequence expressor is also operative to express said alphanumeric string in a manner wherein a third plurality of nucleotides are represented by at least one third representing attribute, and a fourth plurality of nucleotides are represented by at least one fourth representing attribute, said fourth representing attribute being different from said third representing attribute.

66. A genomic display system according to claim 65 and wherein said third plurality of nucleotides are represented by at least one third representing attribute, and said fourth plurality of nucleotides are represented by at least one fourth representing attribute, said at least one third representing attribute being different from said at least one fourth representing attribute.

67. A genomic display system according to claim 65 and wherein said first plurality of nucleotides are purine nucleotides, said second plurality of nucleotides are pyrimidine nucleotides, said third plurality of nucleotides are adenine and thymine nucleotides, and said fourth plurality of nucleotides are guanine and cytosine nucleotides.

68. A system for graphically displaying genomic sequence information, the system comprising:

a genomic sequence expressor, receiving a first alphanumeric string representing a first genomic sequence and a second alphanumeric string representing a second genomic sequence, said second genomic sequence being a reversed-inversed genomic sequence of said first genomic sequence; and expressing said first alphanumeric string and said second alphanumeric string, in a manner wherein that a graphical expression of said second alphanumeric string is a horizontal and vertical mirror image of a graphical expression of said first alphanumeric string; and

a display operative to receive an output from said genomic sequence expressor and to provide a visually sensible display of said graphical expression of said first alphanumeric string and said graphical expression of said second alphanumeric string.

69. A genomic display system according to claim 68 and wherein:

said genomic sequence expressor is also operative to receive an alphanumeric string which represents genomic sequence data, said alphanumeric string comprising a plurality of characters, each of said plurality of characters representing a nucleotide in said genomic sequence, and to express said alphanumeric string using a representation which distinguishes a first plurality of nucleotides, sharing in common a first genomic attribute, from a second plurality of nucleotides, sharing in common a second genomic attribute, said second genomic attribute being different from said first genomic attribute; and

said display is also operative to receive an output from said expressor and to display said genomic sequence using said representation.

70. A genomic display system according to claim 69 and wherein said genomic sequence expressor is operative to express said alphanumeric string in a manner wherein said first plurality of nucleotides are represented by at least one first representing attribute, and said second plurality of nucleotides are represented

by at least one second representing attribute, said second representing attribute being different from said first representing attribute.

71. A genomic display system according to claim 69 and wherein said representation comprises a human sensible representation.

72. A genomic display system according to claim 70 and wherein said representation comprises a human sensible representation.

73. A genomic display system according to claim 72 and wherein said at least one first representing attribute and said at least one second representing attribute are graphical attributes.

74. A genomic display system according to claim 73 and wherein said graphical attributes are shapes.

75. A genomic display system according to claim 73 and wherein said graphical attributes are positions.

76. A genomic display system according to claim 75 and wherein said positions are vertical positions.

77. A genomic display system according to claim 73 and wherein said graphical attributes are orientations.

78. A genomic display system according to claim 77 and wherein said orientations are vertical orientations.

79. A genomic display system according to claim 73 and wherein said graphical attributes are colors.

80. A genomic display system according to claim 72 and wherein using said representation also includes representing each of the following four nucleotides:

adenine,
thymine,
cytosine, and
guanine,

by a different color.

81. A genomic display system according to claim 73 and wherein said human sensible representation comprises one of the following: a shape with a letter and a shape without a letter.

82. A genomic display system according to claim 73 and wherein said human sensible representation is produced using a computer font.

83. A genomic display system according to claim 82 and wherein said computer font is a TRUETYPE® font.

84. A genomic display system according to claim 70 and wherein said first plurality of nucleotides are purine nucleotides, and said second plurality of nucleotides are pyrimidine nucleotides.

85. A genomic display system according to claim 70 and wherein said first plurality of nucleotides consists of adenine and thymine nucleotides, and said second plurality of nucleotides consists of guanine and cytosine nucleotides.

86. A genomic display system according to claim 70 and wherein said representation also distinguishes a third plurality of nucleotides, sharing in common a third genomic attribute, from a fourth plurality of nucleotides, sharing in common a fourth genomic attribute, said fourth genomic attribute being different from said third genomic attribute.

87. A genomic display system according to claim 86 and wherein said third plurality of nucleotides are represented by at least one third representing attribute, and said fourth plurality of nucleotides are represented by at least one fourth representing attribute, said at least one third representing attribute being different from said at least one fourth representing attribute.

88. A genomic display system according to claim 86 and wherein said first plurality of nucleotides are purine nucleotides, said second plurality of nucleotides are pyrimidine nucleotides, said third plurality of nucleotides are adenine and thymine nucleotides, and said fourth plurality of nucleotides are guanine and cytosine nucleotides.

89. A computer-readable medium comprising a computer program, the computer program being operative, when in operative association with a computer, to perform the following steps:

- receiving an alphanumeric string representing genomic sequence data, said alphanumeric string comprising a plurality of characters, each of said characters representing a nucleotide in said genomic sequence; and

expressing said alphanumeric string using a representation which distinguishes a first plurality of nucleotides, sharing in common a first genomic attribute, from a second plurality of nucleotides, sharing in common a second genomic attribute, said second genomic attribute being different from said first genomic attribute.

90. A computer-readable medium according to claim 89 and wherein said first plurality of nucleotides are represented by at least one first representing attribute, and said second plurality of nucleotides are represented by at least one second representing attribute, said second representing attribute being different from said first representing attribute.

91. A computer-readable medium according to claim 89 and wherein said representation comprises a human sensible representation.

92. A computer-readable medium according to claim 90 and wherein said representation comprises a human sensible representation.

93. A computer-readable medium according to claim 92 and wherein said at least one first representing attribute and said at least one second representing attribute are graphical attributes.

94. A computer-readable medium according to claim 93 and wherein said graphical attributes are shapes.

95. A computer-readable medium according to claim 93 and wherein said graphical attributes are positions.

96. A computer-readable medium according to claim 95 and wherein said positions are vertical positions.

97. A computer-readable medium according to claim 93 and wherein said graphical attributes are orientations.

98. A computer-readable medium according to claim 97 and wherein said orientations are vertical orientations.

99. A computer-readable medium according to claim 93 and wherein said graphical attributes are colors.

100. A computer-readable medium according to claim 92 and wherein using said representation also includes representing each of the following four nucleotides:

adenine,

thymine,

cytosine, and

guanine,

by a different color.

101. A computer-readable medium according to claim 93 and wherein said human sensible representation comprises one of the following: a shape with a letter and a shape without a letter.

102. A computer-readable medium according to claim 93 and wherein said human sensible representation is produced using a computer font.

103. A computer-readable medium according to claim 102 and wherein said computer font is a TRUETYPE® font.
104. A computer-readable medium according to claim 89 and wherein said representation comprises a machine sensible representation.
105. A computer-readable medium according to claim 90 and wherein said representation comprises a machine sensible representation.
106. A computer-readable medium according to claim 105 and wherein said at least one first representing attribute and said at least one second representing attribute are machine sensible attributes.
107. A computer-readable medium according to claim 90 and wherein said first plurality of nucleotides are purine nucleotides, and said second plurality of nucleotides are pyrimidine nucleotides.
108. A computer-readable medium according to claim 90 and wherein said first plurality of nucleotides consists of adenine and thymine nucleotides, and said second plurality of nucleotides consists of guanine and cytosine nucleotides.
109. A computer-readable medium according to claim 90 and wherein said representation also distinguishes a third plurality of nucleotides, sharing in common a third genomic attribute, from a fourth plurality of nucleotides, sharing in common a fourth genomic attribute, said fourth genomic attribute being different from said third genomic attribute.

110. A computer-readable medium according to claim 109 and wherein said third plurality of nucleotides are represented by at least one third representing attribute, and said fourth plurality of nucleotides are represented by at least one fourth representing attribute, said at least one third representing attribute being different from said at least one fourth representing attribute.

111. A computer-readable medium according to claim 109 and wherein said first plurality of nucleotides are purine nucleotides, said second plurality of nucleotides are pyrimidine nucleotides, said third plurality of nucleotides are adenine and thymine nucleotides, and said fourth plurality of nucleotides are guanine and cytosine nucleotides.

112. A computer-readable medium comprising a computer program, the computer program being operative, when in operative association with a computer, to perform the following steps:

receiving a first alphanumeric string representing a first genomic sequence and a second alphanumeric string representing a second genomic sequence, said second genomic sequence being a reversed-inversed genomic sequence of said first genomic sequence; and

graphically displaying said first alphanumeric string and said second alphanumeric string, such that a graphical display of said second alphanumeric string is a horizontal and vertical mirror image of a graphical display of said first alphanumeric string..

113. A method according to claim 112 and wherein said method also comprises expressing said first alphanumeric string and said second alphanumeric string using a representation which distinguishes a first plurality of nucleotides, sharing in common a first genomic attribute, from a second plurality of nucleotides, sharing in common a second genomic attribute, said second genomic attribute being different from said first genomic attribute.

114. A method according to claim 113 and wherein said first plurality of nucleotides are represented by at least one first representing attribute, and said second plurality of nucleotides are represented by at least one second representing attribute, said second representing attribute being different from said first representing attribute.

115. A method according to claim 113 and wherein said representation comprises a human sensible representation.

116. A method according to claim 114 and wherein said representation comprises a human sensible representation.

117. A method according to claim 116 and wherein said at least one first representing attribute and said at least one second representing attribute are graphical attributes.

118. A method according to claim 117 and wherein said graphical attributes are shapes.

119. A method according to claim 117 and wherein said graphical attributes are positions.

120. A method according to claim 119 and wherein said positions are vertical positions.

121. A method according to claim 117 and wherein said graphical attributes are orientations.

122. A method according to claim 121 and wherein said orientations are vertical orientations.

123. A method according to claim 117 and wherein said graphical attributes are colors.

124. A method according to claim 116 and wherein using said representation also includes representing each of the following four nucleotides:

adenine,

thymine,

cytosine, and

guanine,

by a different color.

125. A method according to claim 117 and wherein said human sensible representation comprises one of the following: a shape with a letter and a shape without a letter.

126. A method according to claim 117 and wherein said human sensible representation is produced using a computer font.

127. A method according to claim 126 and wherein said computer font is a TRUETYPE® font.

128. A method according to claim 114 and wherein said first plurality of nucleotides are purine nucleotides, and said second plurality of nucleotides are pyrimidine nucleotides.

129. A method according to claim 114 and wherein said first plurality of nucleotides consists of adenine and thymine nucleotides, and said second plurality of nucleotides consists of guanine and cytosine nucleotides.

130. A method according to claim 114 and wherein said representation also distinguishes a third plurality of nucleotides, sharing in common a third genomic attribute, from a fourth plurality of nucleotides, sharing in common a fourth genomic attribute, said fourth genomic attribute being different from said third genomic attribute.

131. A method according to claim 130 and wherein said third plurality of nucleotides are represented by at least one third representing attribute, and said fourth plurality of nucleotides are represented by at least one fourth representing attribute, said at least one third representing attribute being different from said at least one fourth representing attribute.

132. A method according to claim 130 and wherein said first plurality of nucleotides are purine nucleotides, said second plurality of nucleotides are pyrimidine nucleotides, said third plurality of nucleotides are adenine and thymine nucleotides, and said fourth plurality of nucleotides are guanine and cytosine nucleotides.